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Contribution to the study of the ground-beetle fauna of Osogovo Mountain (Bulgaria). II. Morphological and taxonomic investigations of the genus *Molops* Bonelli (Coleoptera: Carabidae: Pterostichini)

Borislav GUEORGUIEV

Molops s. str. is a Southeast European subgenus, represented by 36 species and 73 subspecies and classified by MLYNAR (1977) into 11 supraspecific groups, with 3 species remaining outside these groups. Since then only MORVAN (1980) has added two new subspecies - *M. elatus muetingi* and *M. piceus kashmirensis* from Kashmir (Northwest India). For the time being the last region is the most distant eastern boundary of the distribution of the genus.

During the last several months, I have examined adults of *Molops robustus* Dej., *M. rufipes* Chaudoir and *M. piceus* Panzer from Osogovo Mt., the fifth highest mountain in Bulgaria (Peak Ruen - 2251 m). Up to now there are no data in the literature for this interesting pterostichine genus occurring there. Osogovo is situated on the Bulgarian-Macedonian border, in the very centre of the Balkan Peninsula and is part of the Osogovo-Belasitsa massif. For more information on the studied area see the first paper of the author on this subject (GUEORGUIEV, 1996). The present paper contains complete faunistical information, some ecological notes and descriptions of two new subspecies - *M. rufipes denteletus* n. subsp. and *M. piceus osogovensis* n. subsp.

Material and methods

The present work is based on the study of 101 specimens, most of which collected by the author during the periods of April-November 1994 and April-October 1995 in the Bulgarian part of Osogovo. The bulk of them were caught by traps (using 25-30 % water solution of ethylene glycol as fixative). The rest were collected by hand (under stones and logs). Six specimens, collected by Nenko Radev in 1926, are enlisted too. Similarly an additional material was used for comparison from other Bulgarian regions. Male genitalia were extracted, following the procedure given by КРЫЖАНОВСКИЙ, ЕМЕЦ (1972). All determinations were accomplished by MLYNAR (1977). Table 1 presents data on the variations in the main mensural characteristics of adults. The abbreviations used herein are as follows:

IZ - Institute of Zoology, Sofia (Bulgaria)
NMNH - National Museum of Natural History, Sofia (Bulgaria)
BL - body length (from anterior margin of clypeus to the elytrae apex)
BW - greatest width of body
EB - width of elytrae base
EL - greatest length of elytrae (from the basal margin to the apex of the sutural angle)
EW - greatest width of elytrae
HW - greatest width of head (with eyes)
M - arithmetic mean (obtained final result from the sum of the added measurements divided of the number of the specimens)
NF - number females
NM - number males
PA - width of pronotum apex
PB - width of pronotum base
PL - length of pronotum (along its median line)
PW - greatest width of pronotum

The descriptions of the habitats where the molopses were collected are the following:

H 1. Secondary coniferous plantations above the Hisarluka Park, 640-670 m, before Bogoslov Village. *Pinus nigra* predominating, as well as *Pinus silvestris* and *Corylus avellana*.

H 2. Beech forest at 940-970 m near the road between Bogoslov Village - Trite Bouki Hut.

H 3. Beech forest in the place called Popovi Livadi, 1230-1260 m.

H 4. Meadows used for pastures in the place Popovi Livadi, 1230-1260 m.

H 5. Spruce forest near Iglika Hut, 1320-1340 m.

H 6. Beech forest near Iglika Hut, 1330-1350 m.

H 7. Deciduous mesophillous forest near a big torrent, on the side of the road between Trite Bouki Hut - Novo Selo Village, 1300-1350 m.

H 8. Mixed forest above the Reserve Kyustendil, 1350-1400 m.

H 9. Riverside woody damp place by Mlachka Reka River, near Chervena Yabulka Village, 1440-1460 m.

H 10. Beech forests with glades round Trite Bouki Hut, 1540-1570 m.

H 11. Coniferous forest by the Trite Bouki Hut, 1540-1570 m.

H 12. Juniper bushes (*Juniperus sibirica*) habitat between Trite Bouki Hut and Begbunar Spring, 1700 m.

H 13. Grassy formations (woodless belt) between Begbunar Spring and Ruen Peak, 1850-2251 m.

Molops robustus Dejean

Feronia robusta Dejean, 1828: 411. Type locality: "Hongrie, dans le Bannat".

Diagnosis. The adults of this species can not be mistaken for other species of

Molops. Their correct determination accomplish by quite distant outer basal fovea from pronotum side.

Distribution. South-West Romania (Banat), Serbia, West Bulgaria (up to the line Zlatishki Prohod Pass - Bogdan Hut - Kostenets in the east).

Material examined. H 1 (traps: V.1994, 2 male; VI.1994, 1 female; VI.1995, 1 male, 1 female); H 9 (2.IX.1994, 1 male). First report for Osogovo! The material is preserved in NMNH.

Subspecific relations. This is the southernmost population of *M. robustus*. According to MLYNAR (1977), the populations from the nortnern parts of the areal (north of the line Suva Mt. - West Stara Planina Mts.) belong to *M. r. robustus* and those from the southern parts - to *M. r. parallelus* Mlynar. A preliminary comparison between individuals from West Stara Planina Mts., Sredna Gora Mts., Lozenska Planina Mt., Rila Mt. (Kostenets; Borovets), Zemen Gorge, Golo Burdo Mt., Lyulin Mt. and Vitosha Mt. did not reveal any serious morphological differences in support of the thesis of Mlynar, including the form of the penis. This has led to doubts, concerning the real validity of *M. r. parallelus*. Nevertheless this situation will remain unchanged until a future investigation of the type material or a material from the type locality, as well as if there is more abundant material from the different parts of the areal of *M. robustus*.

Results of the examinations. Body length 17,0-17,8 mm (mean 17,48 mm) in males and 18,8-19,0 mm (mean 18,9 mm) in females. In this mark they stand between *M.r.robustus* and *M.r.parallelus*. The average value of the relation PW/PL is 1,46-1,47, just like *M.r.robustus*. According to MLYNAR (1977) the inner basal fovea of *M.r.parallelus* is indistinct or missing, but the studied specimens have clear inner fovea. Aedeagus is just like *M.r.robustus*, but its top (dorsal view) is slightly curved to right. No doubt that the examined specimens belong to the nominate subspecies of *M.robustus*.

Note. First ЙОАКИМОВ (1904) gives information for the closest locality to Osogovo - Kyustendil, 4th May 1898, determining it as *M. rostratus*. In V.GUEORGUIEV, B.GUEORGUIEV (1995) this locality is included with *M. r. parallelus*, following Mlynar's view. After the discovery of Ioakimov's material I found out that it was undeterminable (no heads and pronotums). Nevertheless I think that it belongs to the typical *M. robustus robustus*.

Habitat. In the Osogovo Mt. it prefers shady forests (H 1) and woody riverside places with higher humidity (H 9). Not been found in the driest period (July-August) there. Rare.

Molops rufipes denteletus n.subsp.

Diagnosis. Distinguished by the longer and more slender aedeagus top (Fig. 1a, 1b, 1c, dorsal view) and pronotum after the middle stronger narrow (Fig. 2a, 2b) from the most relative *M. r. golobardensis* Mlynar. Also by straighter and not so thin aedeagus top (dorsal view) than that of *M. r. rufipes* Chaudoir (Fig. 1d).

Description. Body length: males 12,3-15,1 mm (in holotype 13,4 mm); females 12,6-15,0 mm; width: males 4,6-5,7 mm (in holotype 4,6 mm); females 4,5-6 mm. Body robust, oval and convex, above black; antennae black, terminal antenomeres brownish;

palpi and tarsi light reddish brown; legs (without tarsi) reddish brown to brown; body ventral lighter than dorsal; microsculpture absent.

Head smooth dorsally without punctuation; frontal furrows deep, reaching eyes level.

Pronotum clearly heart-shaped, widest at first third, rather narrower backward then forward, PW/PL 1,47-1,62 (M 1,53) in 51 males and 1,48-1,60 (M 1,55) in 29 females; sides before dentiform protruding outside hind angles concave; one setigerous pore near to hind angles; anterior margin of pronotum concave; posterior nearly straight; two basal foveae well marked.

Elytra convex and oval; EW/PW 1,05-1,16 (M 1,11) in 51 males, while 1,14-1,22 (M 1,18) in 29 females; shoulders elytrae angulate; scutelar stria not reach to sutura (sometimes missing of one elytra), without basal pore; intervals smooth and impunctate.

1

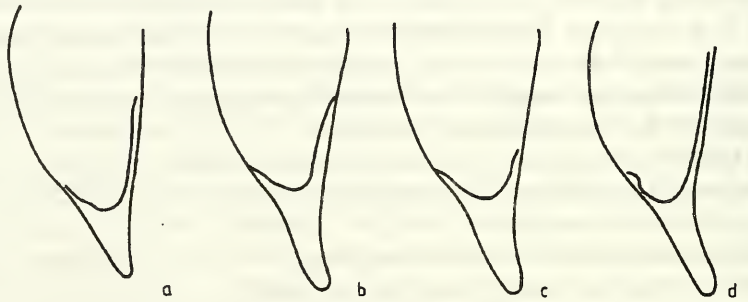

Fig. 1. Aedeagus top (dorsal view): a - *Molops rufipes golobardensis* Mlynar from Zemen Gorge; b - *Molops rufipes denteletus* n. subsp., holotype; c - *Molops rufipes denteletus* n.subsp., variation; d - *Molops rufipes rufipes* Chaudoir (after Mlynar)

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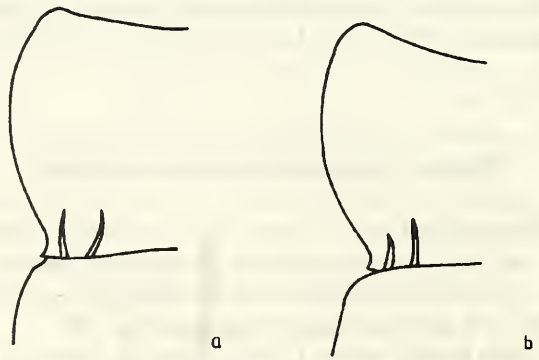

Fig. 2. Pronotum: a - *Molops rufipes golobardensis* from Golo Burdo Mt. (type locality), male; b - *Molops rufipes denteletus* n. subsp., holotype, male

Table 1
Variation of the main mensural characteristics of adults

Measurements	M. rufipes denteletus	M.piceus osogovensis
NM/NF	51 / 29	9 / 3
BL (mm)	12,3-15,1 / 11,2-15,0	11,0-12,7 / 12,5-12,7
M (mm)	13,76 / 14,01	11,74 / 12,57
BW (mm)	4,6-5,7 / 4,5-6,0	3,8-4,7 / 4,3-4,7
M (mm)	5,11 / 5,44	4,2 / 4,6
PW/HW	1,36-1,52 / 1,35-1,5	1,29-1,33 / 1,29-1,33
M	1,45 / 1,43	1,31 / 1,31
PW/PL	1,47-1,62 / 1,48-1,60	1,36-1,44 / 1,38-1,45
M	1,53 / 1,55	1,40 / 1,42
PW/PA	1,26-1,38 / 1,25-1,37	1,26-1,32 / 1,24-1,29
M	1,31 / 1,3	1,28 / 1,26
PW/PB	1,34-1,55 / 1,33-1,58	1,41-1,48 / 1,39-1,43
M	1,45 / 1,43	1,44 / 1,41
EW/PW	1,05-1,16 / 1,14-1,22	1,09-1,13 / 1,14-1,17
M	1,11 / 1,18	1,11 / 1,16
EL/EW	1,33-1,47 / 1,28-1,43	1,39-1,45 / 1,43-1,48
M	1,40 / 1,38	1,42 / 1,45
EW/EB	1,3-1,47 / 1,39-1,5	1,35-1,51 / 1,45-1,51
M	1,40 / 1,41	1,43 / 1,48

For more information about mensural characteristics of new subspecies see Table 1.

Type material. Holotype male with label "BULGARIA, Osogovo Mt., Peak Shapka, 1800-2000 m, 3.IX.1995, B.Gueorguiev". Paratypes: H 1 (traps: V.1994, 10 male, 2 female; VI.1994, 1 male; VI.1995, 4 male, 1 female). H 3 (traps: V.1994, 8 male, 5 female; VI-VII.1994, 2 male). H 4 (traps: IV.1994, 2 male, 3 female; V.1994, 1 male; VI-VII.1994, 1 male). H 5 (traps: IX-X.1995, 1 female). H 6 (25.IV.1995, 3 male, 3 female, collecting in last year's fireplace; 25.IV.1995, 1 male, 1 female collecting under chipboards; traps: V.1995, 1 male). H 7 (9.VI.1995, 1 male). H 8 (27.IV.1994, 1 female, collecting under fall timber during the rain). H 10 (9.VI.1995, 1 female). H 11 (traps: VI.1995, 1 male). H 12 (traps: VII-VIII.1995, 4 male). H 13 (Tash-Tepe Peak, 1993 m, 21.VI.1926, 1 female, N. Radev; Ruen Peak, 2251 m, 1 male, 4 female, N. Radev; traps: VII.1994, Tsarni Kamak Peak, 2000 m, 1 male, 1 female; 8.VI.1995, 6 male, 8 female; traps: VI-VII.1995, 2 male). All type material is preserved in NMNH.

Note. All the six specimens, collected by Nenko Radev from H 13 were determined as *Molops alpestris centralis* Mlynar by Prof. Dr. O. Kryzhanovskij. We followed his view (B.GUEORGUIEV, V.GUEORGUIEV, 1995; V.GUEORGUIEV, B.GUEORGUIEV, 1995). After a second determination of the same material and extraction of the male genitalia I established that this is *M. rufipes denteletus.*

Distribution. Osogovo Mt., 640-2251 m.

Habitat. Prefers forests, but was also found in damp open habitats above the upper forest border. More specimens from H 13, collected on 8.VI.1995 above 1900 m

were found in proximity to snow spots. Usual.

Etymology. Derived from the name Denteleti, an ancient local Thracian tribe, which inhabited the lowland of Kyustendilska Kotlovina as well as the low north slopes of Osogovo Mt. till the end of III A.D.

Molops piceus osogovensis n.subsp.

Diagnosis. Distinguished by aegeagus right side rather rectilinear (dorsal view) than that of its relatives *M.p.balcanicus* Mlynar and *M.p.bulgaricus* Maran (Fig. 3a, 3b, 3c, dorsal view). Hind angles of the pronotum are more protruding outwards than in the two related taxa. Elytrae apex females (Fig. 4a, 4b) less concave before the top tooth than that of *M. p. bulgaricus* (I was not able to compare this feature with *M.p.balcanicus* because of the lack of female specimens). Distinguished by form of the aedeagus top (dorsal view) of *M. p. piceus* Panzer (Fig. 3d) males and by quite less concave elytrae apex from that of *M. p. piceus* (Fig. 4c) females.

Description. Body length: males 11,0-12,7 mm (in holotype 12 mm); females 12,5-12,7 mm; width: males 3,8-4,7 mm (in holotype 4,2 mm); females 4,3-4,7 mm. Body oval and convex, above dark brown to black; antennae, mouth parts and legs (sometimes femore more blackened) reddish brown to brown; body ventral lighter than dorsal; microsculpture absent.

Head smooth dorsally without punctuation; frontal furrows deep, wide and reach eyes level, slightly to the eyes turned.

Pronotum heart-shaped, widest before middle, backward narrower then forward, PW/PL 1,36-1,44 (M 1,40) in 9 males and 1,38-1,45 (M 1,42) in 3 femals; anterior margin concave, posterior nearly straight; inner basal foveae deeper and longer marked than outer; one setigerous pore near to dentiform protruding outside hind angles.

Elytra rather convex with more or less oval rounded sides, widest at middle; EW/PW 1,09-1,13 (M 1,11) in 51 males, while 1,14-1,17 (M 1,16) in 29 females; shoulder elytra with presence of angle; scutelar stria not reach to sutura and without basal pore; intervals smooth and impunctate; elytrae apex of females with presence of distinct tooth.

For more information about mensural characteristics of new subspecies see Table 1.

Type material. Holotype male with label: "BULGARIA, Osogovo Mt., coniferous forest by Iglika Hut, 1350 m, V.1995, B.Gueorguiev" (collected at H 5 in traps). Paratypes. H 1 (traps: V.1994, 1 male; V.1995, 1 male). H 2 (traps: V.1994, 3 male, 1 female; VI.1994, 1 male; X.1994, 2 female; VI.1995, 1 male). H 6 (25.IV.1995, 1 male, collecting under chipboards). All type material is preserved in NMNH.

Note. First IOAKIMOV (1904) gave information for the closest locality to Osogovo - Kyustendil, 4th May 1898, determining it as *M. piceus*. V.GUEORGUIEV and B.GUEORGUIEV (1995) included it with *M. piceus bulgaricus*. Although Ioakimov's material is broken (no heads and pronotums), I think that it belongs to *M. piceus osogovensis*.

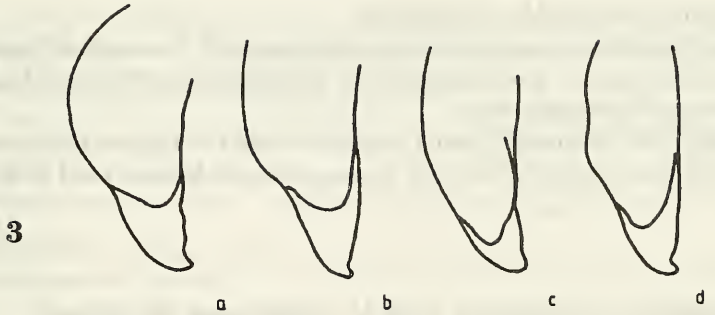

Fig. 3. Aedeagus top (dorsal view): a - *Molops piceus osogovensis* n. subsp., holotype; b - *Molops piceus bulgaricus* Maran from Rila Mt. - Borovets (type locality); c - *Molops piceus balcanicus* Mlynar from Montenegro, Zablyak, Tsarno Ezero, 1450 m, det. R.Monguzzi; d - *Molops piceus piceus* (Panzer) (after Mlynar)

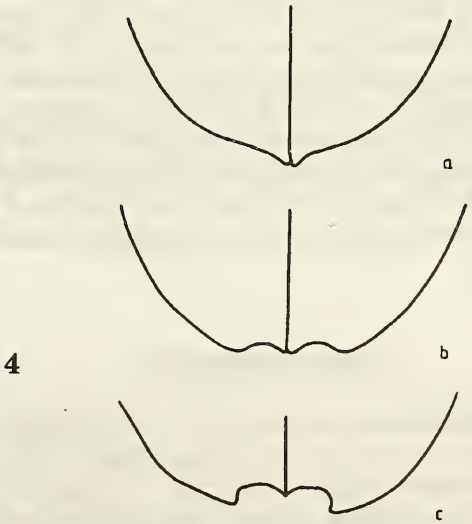

Fig. 4. Elytrae apex: a - *Molops piceus osogovensis* n. subsp., female; b - *Molops piceus bulgaricus* Maran from Vitosha Mt., female; c - *Molops piceus piceus* (Panzer), female (after Mlynar)

Distribution. Osogovo Mt., 640-1350 m.

Habitat. Typical forest carabid which prefers shady (H 1) or sunless damp forests (H 2, H 5), on rare occasions - sparse forests (H 6). Like *M.robustus* it has not been found in the driest season July-August. Rare.

Etymology. The subspecific name comes from that of the mountain on which the type material was collected. "Osogovo" is an ancient Bulgarian word with obscure sense.

Sympatry or allopatry with *M. rufipes* and *M. piceus*?

According to MLYNAR (1977) *rufipes* group (with two polytypic species) and *piceus* group (with one polytypic species) are similar following a number of basic morphological features. Together they form one of the three main lines of evolutionary development of *Molops*, which "ist grundsätzlich von den Gruppen I-VI und auch VII-IX verschieden" (MLYNAR, 1977, p.22). The same author (1977, p.28) considers both groups as allopatric in the mountains of Macedonia and North Greece. The *rufipes* group is completely replaced by the *piceus* group there. However, in contrast to that I established that in some Bulgarian mountains both groups are sympatric. In Osogovo Mt. *M.rufipes denteletus* and *M.piceus osogovensis* live together. In H 1 and H 6 these subspecies were found during the same months, while in H 5 they were caught at different times and in H 2 *M.rufipes denteletus* was not found at all. In Vitosha Mt. (unpublished information) I came upon *M. rufipes cf. golobardensis* and *M.piceus bulgaricus* in one and the same locality, just like H 1 and H 6 on Osogovo. *M.rufipes klisuranus* Apfelbeck and *M.piceus bulgaricus* inhabit Middle Stara Planina Mts. (V.GUEORGUIEV, B.GUEORGUIEV, 1995), while *M.rufipes belasicensis* Mlynar and *M.piceus bulgaricus* have been established from Belasitsa Mt. Of course, the principle of allopatry would be valid mainly for close species (from one species group) and much less for species from different species groups.

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Принос към изучаването на бръмбарите-бегачи от Осоговската планина. II. Морфологични и таксономични изследвания върху род *Molops* Bonelli (Coleoptera: Carabidae: Pterostichini)

Борислав ГЕОРГИЕВ

(Р е з ю м е)

При изучаване на материали от род *Molops* от българската част на планината бяха установени *M. robustus robustus* Dej., *M. rufipes denteletus* n. subsp. и *M. piceus osogovensis* n. subsp., нови за района.

За всеки подвид са посочени находищата, вертикалното разпространение, вида на хабитатите и сезонната активност на имагото. При описанието на новите таксони са използвани измервания на основните морфологични съотношения на главните таксономични белези на възрастните молопси. Изказано е съмнение за валидността на *M. robustus parallelus* Mlynar. Изследван е събраният от автора през април - ноември 1994 г. и април - октомври 1995 г. материал, както и екземплярите, събрани през 1926 г. от Ненко Радев, съхранявани в колекциите на Националния природонаучен музей (София).